

*REMARKS/ARGUMENTS**The Pending Claims*

Claims 1-22 currently are pending. Claim 23 has been withdrawn from consideration pursuant to a restriction requirement. Claims 1-22 are directed toward a polishing system comprising (a) a liquid carrier, (b) a polymer having a degree of branching of about 50% or greater, and (c) a polishing pad, an abrasive, or a combination thereof. Reconsideration of the claims is respectfully requested in view of the remarks herein.

Discussion of the Claim Amendments

Claim 1 has been amended, for clarification, to recite that the polishing system comprises a branched polymer having a degree of branching of about 50% or greater. Dependent claims 4, 5, 7, 9, 13-16, and 18-19 have been similarly amended to refer to the polymer of claim 1 as a branched polymer. This clarification is consistent with the entirety of the disclosure of the pending application. Support for these amendments also can be found at, for example, paragraphs [0010], [0015], [0018], and [0038] of the specification. No new matter has been added by way of these amendments.

Summary of the Office Action

Claims 1-3, 14-20, and 22 stand rejected under 35 U.S.C. § 103(a) as allegedly obvious over European Patent Application 1 279 708 A1 (Sakai et al.). Claim 21 stands rejected under 35 U.S.C. § 103(a) as allegedly obvious over the Sakai reference in view of U.S. Patent Application Publication 2002/0125461 A1 (Chou et al.). Applicants acknowledge with appreciation the indication that claims 4-13 contain allowable subject matter.

Summary of the Examiner Interview

Applicants thank Examiner Umez-Eronini for the courtesies extended to Applicants' representatives, Caryn Borg-Breen and Ashlee Mehl, during the telephonic interview of December 27, 2006. The Section 103 rejection was discussed, consistent with the claim amendments and remarks set forth herein.

Discussion of the Obviousness Rejections

Applicant respectfully traverses the obviousness rejections for two reasons: (1) the cited references fail to teach or suggest all of the limitations of the pending claims and (2) the cited references provide no motivation to lead a person of ordinary skill in the art to modify the polymers disclosed therein in such a way as to arrive at the invention defined by the pending claims. Contrary to the Office Action's assertions, therefore, the invention defined by the pending claims is not *prima facie* obvious over the Sakai reference, alone or in view of the Chou reference.

First, the Sakai reference does not teach the use of a branched polymer, let alone a branched polymer having a degree of branching of 50% or greater. The Sakai reference discloses a group of organic compounds including a polyethylene oxide, a polypropylene oxide, a polyoxyethylene alkyl ether, a polyoxypropylene alkyl ether, a polyoxyethylenepolyoxypropylene alkyl ether, and a polyoxyalkylene addition polymer having a triple bond that is optionally substituted with C₁-C₁₀ alkyl groups (see paragraph [0030] of the Sakai reference). As discussed above, the pending claims have been amended to require a branched polymer having a degree of branching of about 50% or greater.

A branched polymer is a polymer with secondary polymer chains extending from the main polymer backbone. In other words, it is a polymer that has monomer units which are branched by additional polymer chains (see enclosed Kirk-Othmer Encyclopedia of Chemical Technology, McGraw-Hill AccessScience, Science and Technology Encyclopedia, and Wikipedia printouts). In some instances, but not all, the branch chains may be the same polymer as that of the main polymer backbone. In any event, the branching chain must also be a polymer. The polyoxyalkylene addition polymer disclosed by the Sakai reference is illustrated by formula (1) of the disclosure (see paragraph [0019] of the Sakai reference). A person of ordinary skill in the art would understand that if formula (1) were a branched polymer, X and Y (the polymeric portions of formula (1)'s backbone) would include secondary polymer branch chains. The disclosure of the Sakai reference, however, indicates that each of X and Y is an ethylene-oxy group or a propylene-oxy group. An ethylene-oxy group is not at all branched. Further, although a propylene-oxy group is technically branched with a methyl group, a methyl group is not a polymer. As neither polymeric portion of

formula (1) is branched by a polymer side-chain, formula (1) of the Sakai reference is not a branched polymer. The Sakai reference does not disclose a branched polymer, let alone a branched polymer having a degree of branching of about 50% or greater, as is required by the pending claims. Therefore, the Sakai reference fails to teach all of the elements of the invention defined by the pending claims.

In addition to its failure to disclose a branched polymer, the Sakai reference also fails to suggest any compound exhibiting a degree of branching of about 50% or greater. The Office Action questions Applicants' basis for estimating that the Sakai reference discloses a compound having only four out of a total possible twelve branch points along its backbone. As explained in Applicants' disclosure, when the chemical structure of the branched polymer is known, the polymer's degree of branching can be theoretically determined by dividing the number of branched monomer sites by the total number of monomer sites that are capable of branching (see paragraph [0023] of the present specification). If the chemical structure of the branched polymer is unknown, the degree of branching can be determined by NMR spectroscopy (see paragraph [0024] of the present specification). Because the Sakai reference provides chemical structures in accordance with its disclosure, NMR spectroscopy is not necessary to determine the degree of branching. When X and Y are ethylene-oxy groups, and when m and n are one (the minimum value in accordance with the disclosure), formula (1) has twelve possible branch points at the carbon atoms along its backbone. However, formula (1) has only four branch points (R_3 - R_6) of the possible twelve branch points. The degree of branching of formula (1) of the Sakai reference, considering the branching of all carbon atoms along the compound's backbone, is therefore approximately 33%, i.e., far less than the minimum 50% branching required by the pending claims. The disclosure of compounds that are not branched polymers, and that are not highly-branched, certainly fails to suggest the use of the branched polymers having a degree of branching of at least 50%, as required by the pending claims.

The Office Action also points to formula (3) of the Sakai reference as an example of known branched polymers. However, formula (3), which is an example of a polymer according to the general structure of formula (1), similarly fails to disclose a branched polymer, let alone a branched polymer exhibiting a degree of branching of at least 50%. The backbone of formula (3), wherein m and n are fifteen, has a total of sixty-four possible branch

points (see paragraph [0082] of the Sakai reference). Like formula (1), however, it includes only four branch points (R_3 - R_6). In the case of formula (3), therefore, the degree of branching is only 6.25%, which is far less than the 50% minimum required by the pending claims.

Therefore, the Sakai reference fails to teach or suggest all of the limitations of the pending claims. For this reason alone, the subject matter of the pending claims cannot properly be considered *prima facie* obvious over the Sakai reference.

Second, the Sakai reference provides no motivation to lead a person of ordinary skill in the art to modify the polymers disclosed in the Sakai reference in such a way to produce the highly branched polymers defined by pending claims. The Office Action asserts that, because the Sakai reference illustrates a polymer with some degree of branching, it would have been obvious to one of ordinary skill in the art to substitute a polymer with a higher degree of branching in order to suppress recesses on copper wiring that may result from polishing. To the contrary, although the Sakai reference addresses the general recessing problem posed by polishing methods (see paragraphs [0017] and [0018] of the Sakai reference), it does not in any way address the effect of polymer branching on the problem. Instead, the Sakai reference focuses on the particular amount of polymer to be added to best suppress the formation of recesses while also ensuring adequate polishing (see paragraph [0040] of the Sakai reference). There is nothing in the Sakai reference to suggest that further polymer modification might be beneficial. Both the suggestion to use highly branched polymers in a polishing composition, as well as the benefits that accompany their use, are provided only by Applicants' disclosure accompanying the pending claims (see, e.g., paragraphs [0025] and [0026] of the present specification). Therefore, to conclude that the subject matter of the pending claims is obvious over the Sakai reference is to make an improper use of hindsight on viewing the disclosure accompanying the pending claims.

Therefore the subject matter of the pending claims also cannot properly be considered *prima facie* obvious over the Sakai reference because the teaching or suggestion to make the polymer modification is not found in the prior art, but only in Applicants' disclosure.


In view of the foregoing, the Sakai reference fails to teach or suggest all of the elements recited in the pending claims. Moreover, the Chou reference does not satisfy the

deficiencies of the Sakai reference, and the Office Action fails to point to any teaching or suggestion available to those of ordinary skill in the art at the time of the invention that would have motivated one of ordinary skill to modify the disclosure of the Sakai reference in such a way as to arrive at the invention defined by the pending claims. That suggestion is provided only by the pending claims and their accompanying disclosure. For either reason, let alone both reasons, the subject matter of the pending claims cannot properly be considered *prima facie* obvious over the Sakai reference, whether considered alone or in combination with the Chou reference. The rejection under Section 103, therefore, should be withdrawn.

Conclusion

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,


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